MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2210)

DRT5111 – INTRODUCTION TO REAL-TIME SYSTEMS

(DIT)

9 FEBRUARY 2023
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **2** pages (excluding cover page) with **2** sections.
2. Answer **ALL** questions.
3. Write your answers in the answer booklet provided.

Section A: Fill in the blanks (Total: 10 Marks)

Instruction: *Fill in the blanks with the terms given in the table.*

semaphore	task control block	signal-centric	real-time systems	idle
memory compaction	non-pre-emptible resources	task	target debug agent	general-purpose systems
device control registers	data centric	embedded loader	pipe control block	pre-emptible resources

1. _____ are the tangible and intangible components of computer systems where operations are not subject to performance constraints. [1 Mark]

2. _____ gives host debugger sufficient information to provide visual source-level debug capability. [1 Mark]

3. A _____ is an independent thread of execution that contains a sequence of independently schedulable instructions. [1 Mark]

4. A(an) _____ task is to ensure that the processor's program counter is always valid where no other tasks are running. [1 Mark]

5. A _____ is a kernel object that one or more threads of execution can acquire or release for the purposes of synchronization. [1 Mark]

6. A _____ contains the current data byte count, the amount of readable data in the pipe, along with the current input and output. [1 Mark]

7. _____ are accessed recursively during I/O operation and to process data transfer requests. [1 Mark]

8. _____ is the technique used to eliminate external fragmentation by combining the area adjacent to the unused blocks. [1 Mark]

9. _____ communication is referred to as all necessary information is conveyed within the event signal itself. [1 Mark]

10. _____ are those resources that must be voluntarily relinquished by the owning task. [1 Mark]

Continued...

Section B: Structured Questions, 3 Questions (Total: 30 Marks)

Instruction: *Answer **ALL** the questions in the Answer Booklet provided.*

QUESTION 1 (10 Marks)

a) Explain **real-time system**. [4 Marks]

b) There are several approaches for the execution of image in an embedded system. State **THREE (3)** image execution scenarios in embedded system. [3 Marks]

c) It is important to understand the components of Real-Time Operating System (RTOS) kernels in designing RTOS. State and explain the **THREE (3)** components of RTOS kernels. [3 Marks]

QUESTION 2 (10 Marks)

a) Explain the following terms with regards to premature task deletion in RTOS:
   i. Memory leaks [1 Mark]
   ii. Resource leaks [1 Mark]

b) There are several types of semaphores. With an aid of a diagram, explain **mutual exclusion (Mutex) semaphores**. [3 Marks]

c) Explain **event registers** and state the limitations of event registers. [3 Marks]

d) State **TWO (2)** purposes of I/O subsystem. [2 Marks]

QUESTION 3 (10 Marks)

a) Explain the functions of **memory management unit (MMU)**. [4 Marks]

b) List and explain any **THREE (3)** guidelines to identify concurrency. [3 Marks]

c) State and explain any **THREE (3)** conditions that cause the existence of deadlock. [3 Marks]

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